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MODERN MEDICINE AND THE PUBLIC HEALTH.[1]

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It is a noteworthy coincidence that the centennial of the Medical College of this University is also the semicentennial of that reformation of medical education in the United States, which, in its own field, is worthy to be compared with the sixteenth century reformation in theology. One hundred years ago was born in Cincinnati that medical college the centennial of which we now celebrate. Fifty years ago began in Boston—the birthplace of American revolutions—a revolt against the then prevailing laxity of medical education, a nineteenth century reformation which laid the foundations of modern medical education and modern medicine in the United States. The Martin Luther of that medical reformation was Charles William Eliot, then the new and youthful president of Harvard University.

Before 1870 even our best medical schools welcomed, without any educational entrance requirements whatsoever, all students who could pay the prescribed fees. Instruction consisted almost entirely of lectures, the only laboratory open to students being the dissecting room. The lectures were given by practitioners usually too busy to prepare themselves properly, before students often too indolent or too ignorant to profit by them. The school terms, of which only two were required for the degree, were very short—generally about four months each. Hence it was sometimes possible to get the medical degree within a single calendar year. As late as 1887 it was reported as an important fact in American medical education that the terms of our medical colleges had recently been increased from an average of 23.5 weeks to one of 24.9 (i. e., by one-half week), or to nearly six months!

Entrance examinations were held for the first time by the Medical School of Harvard University in 1877, and then only 13 candidates presented themselves, of whom six passed and seven failed. As for the characteristics and bearing of medical students in those days.

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[1] Address delivered at the centennial celebration of the Medical College of the University of Cincinnati, Nov. 6, 1920.

President Eliot said in his annual report for 1879–80: "It is notorious that medical students have been, as a rule, a rougher class of young men than other professional students of similar age." And this was a conservative statement.

At the turning of this low tide I was myself a student in a reputable medical school, and I well remember how much interest was felt in the Harvard experiment, especially by those students who knew that they could not possibly have passed any entrance examinations, however easy, and how much hope for the future was kindled by this forward step among those of us who already held college degrees. Very gradually that hope was fulfilled. Medical courses were extended to three years and then to four, entrance examinations were set up to keep out the poorest of the raw material, laboratories were established, and to-day we are beginning to have whole-time professors ready to exchange the possibly great rewards of private practice for the secure satisfactions of teaching, of study, of research, and of the intellectual life.

When I was in a medical school in 1877 the students went all day from one lecture to another, listening to a stream of words upon every subject in the curriculum, poured out upon everybody, even beginners, in the first year, and repeated, practically unchanged, in the second. No examination was held until the end of the two years, and then the examinations were brief and very easy. Chemistry was expounded by lectures and lecture demonstrations, but without any laboratory practice, and was of the most elementary sort—far below that now obtained by freshmen in colleges and technical schools—and physiology was presented, without laboratory work of any kind, through recitations from a textbook by a young physician, uninformed as to the subject, who had merely taken a similar course under another physician equally ignorant of physiological science. I shall never forget my regret that I had been born too late; for I gathered from the tone of the textbook and the teacher that everything in physiology was already known; that there was therefore nothing under debate, nothing to be settled, nothing new to be discovered. Pathology, what there was of it, was mostly a poor kind of pathological histology demonstrated by miscellaneous and mostly inferior microscopes. It was taught by an old gentleman lately returned from the Orient, where he had long served as a medical missionary. Materia medica and therapeutics were lectured about by a busy practitioner, with occasional illustrations of plants supposed to possess medicinal properties. Obstetrics was likewise taught entirely by lectures, without demonstrations or practice of any kind whatsoever. In this subject, as in most others, a number of books were named for reference, but in this case one prominent treatise was not mentioned. Word was passed down from the upper class that this book, about which the professor had said nothing, was the one from which he drew his lecture material—with the result that the class promptly purchased the one book not recommended and abjured all the others. Theory and practice were given by a physician from a neighboring city who had there a large private practice and was also medical adviser to an important insurance company. This man was, nevertheless, an excellent teacher, and the class really learned a good deal from him and from the books which he advised us to read. The brightest spot in the school was the instruction in surgery, which was taught by a really eminent surgeon,who, however, was overwhelmed with private practice in a large city some 50 miles distant. By him we were taught chiefly through clinics, and I well remember his skeptical but still open-minded attitude as he referred to the antiseptic method (which for him was the antiseptic spray) of Joseph Lister, a method then barely 10 years old, and making its way only very slowly in a profession noted for its conservatism.

Something like this, in the seventies, was characteristic of all the medical schools of the United States; but a new day was about to dawn. Before very long entrance examinations were established in most of the better medical schools. The two years course became three years and, later, four years; laboratory procedures were introduced, not only in chemistry, but also in physiology, in obstetrics, in surgery and in medicine; and all along the line improvements came thick and fast, so that it is now impossible to recognize in the medical school of to-day any resemblance to that earlier type. The requirements are now so thorough and severe that the degree of Doctor of Medicine, which 40 years ago was utterly unworthy to be compared with the degrees of Doctor of Philosophy and Doctor of Science, is to-day in our best schools as difficult to obtain as (and, with the single exception of the amount of research required, in every respect equal to) the degree of Doctor of Philosophy. Indeed, it is probably superior in difficulty of achievement to that degree as it is sometimes given.

I shall not undertake to describe the marvelous medical colleges of to-day. Housed as they sometimes are in veritable palaces, provided with splendid lecture rooms, libraries, and laboratories, and equipped with abundant appliances for instruction and research, they afford to those who, like myself, recall the medical schools of the previous generation, a delightful contrast. I need only suggest a variant of the famous epitaph of Sir Christopher Wren in St. Paul's Cathedral: "If you would see a modern medical school look about you." Together with these wonderful transformations has come to pass that development of medical science and medical service which we proudly call Modern Medicine. It was only 50 years ago that

Semmelweiss's discovery of the dangers of dirt, and Lister's method of counteracting infection in surgery, became serviceable. It is less than 50 years since Pasteur and Koch and their disciples established the surprising fact that the communicable diseases are due to microbic parasites, and revealed to an astonished world a wholly new pathology. It is only 30 years since the corner stones of immunology and serology were securely laid by Pasteur and Metchnikoff and von Behring and Kitasato; and to bring us to a realization of how wonderful are the developments of those arts and sciences to-day we need only summon to testify, diphtheria antitoxin, typhoid vaccination, the Wassermann test, and salvarsan. I spare you praise of modern surgery with its glorious triumphs over such plagues as appendicitis and gastric ulcer and incipient cancer. Before achievements such as these, the whole world stands speechless in awe and admiration.

Happily, modern medical education has for the most part advanced hand in hand with modern medicine. Our best medical schools are to-day temples of medical science and training schools of medical engineering. Their courses are long and arduous, their standards are high, their instruction is sound, thorough, and conscientious. They prepare their pupils admirably for institutional service and for private practice. Their graduates are well qualified as ministers of that original and fundamental function of the physician, viz, the practice of the healing art.

There is, however, one vast and important field of modern medicine thus far sadly neglected by all medical schools, even by the very best, and that is the field of the public health. We have outgrown the ancient point of view which held that "they that are whole need not a physician but they that are sick," for we believe that the maintenance of the public health (i. e., the health of the people), is no less important, and often easier, than is the cure of their diseases. It was probably no mere coincidence which in 1869 led to the establishment of the first of our State boards of health—viz, that of Massachusetts—and in 1872, of the city board of health of Boston, almost contemporaneously with the first fruits of the labors of Pasteur and Lister and Semmelweiss, and with that reformation of medical education in America to which I have already alluded. To-day we have in every one of our 48 States a State department of public health, for the proper administration of which at least 48 experts in public health and sanitary science are needed, with two or three times as many more for field or laboratory work. The United States Public Health Service also requires scores of qualified public health officers, and finds great difficulty in obtaining them. Still others are needed by the Army and the Navy, while hundreds of American counties, cities, towns, and rural regions, either already have or should have whole-time, trained, health officers. Private health agencies, also, such as the International Health Board of the Rockefeller Foundation, numerous antituberculosis societies, the Red Cross, and many others, are at present handicapped in their beneficent undertakings by finding it almost impossible to fill the places which they have with competent, trained personnel. The field of industrial medicine and industrial hygiene is also calling loudly for trained workers; while school physicians who are really expert, mental hygienists, social hygienists, and dental hygienists are likewise greatly needed. And yet, although these facts are patent, we do not find our medical schools, even those of the most modern type, giving much, if any, attention to the Macedonian cry of the hour for training in public health.

This is the more strange, since the beginnings of preventive medicine in the eighteenth century, with inoculation and vaccination for smallpox, and the first steps in experimental medicine, which were taken in establishing the validity of these procedures, have always rightly been regarded as one of the most brilliant benefits conferred on suffering humanity and among the brightest stars in the medical firmament. It is true that from Jenner in 1796 to Pasteur in 1877 the intervening 80 years saw but little progress in preventive medicine. But meantime preventive sanitation arose, with the factory acts of 1802, the installation of public water supplies, the introduction of the water-carriage system of sewerage, with water closets, bathtubs, and plumbing; with garbage, sewage, and refuse collection and disposal; with heating, lighting, ventilation, and disinfection; with convenience stations, public-drinking fountains, and abolition of the common towel and common drinking cup; with the registration of vital statistics and the beginnings of public-health nursing—all of which should have interested the physician hardly less than the sanitary engineer. We can understand that all this complex preventive sanitation may have seemed somewhat outside the field of the physician; but it must certainly be accounted strange that the renascence of preventive medicine since it once began (about 40 years ago), after its 70 years' sleep, and especially as it has been rapidly growing more important ever since, has not been able to win for itself a high place in modern medical training. The fact is that hygiene and the public health, and even preventive medicine, have thus far had scanty recognition in our medical schools. Without pausing to deplore this notorious fact I pass on to point out what I believe to be the remedy—a remedy, moreover, which the medical college of a great municipal university like that of Cincinnati would seem peculiarly well fitted to initiate.

The medical curriculum of to-day is for the most part a strong single track, a narrow one-way road, leading straight to one great terminal—the ancient, well-known, and famous metropolis of the medical degree. To have conceived and constructed and safeguarded and enriched this long and highly graded road, fenced in everywhere against interlopers, and discouraging to set out upon for all excepting those of fitness and attainment, is the great achievement of the generation now passing off the stage. But since 1870 another great, though more modern, city has grown up, apart, but not far from, the original terminal, and a strong branch road is now badly needed, beginning halfway up the line, which shall carry some of the many travelers to this new and thriving suburb, of which the name is "Public Health." Those arriving here should receive the degree of Doctor of Public Health instead of Doctor of Medicine, and should become practitioners, not of medicine, but of the science and arts of the public health.

Instead of the present rigid medical curriculum which resembles the capital letter I, we ought to-day to have a new curriculum of equal height and breadth, but shaped like the capital letter Y, of which the base should still be substantially the first two years of the present curriculum—anatomy, physiology, bacteriology, pathology, etc.—but with its upper parts diverging, the one arm or branch leading as now in the last two years to the degree of Doctor of Medicine (M. D.) and the other in the last two years to the degree of Doctor of Public Health (D. P. H.). That medical school which first begins this reformation will seize a golden opportunity. It is right to provide generously for curative medicine—for surgery, for obstetrics, for gynecology, for otology, for opthalmology, etc. But the medical school which fails to-day to provide also liberal instruction in preventive medicine, in vital statistics, in sanitary science, in public health laboratory methods, in epidemiology; in preventive sanitation, such as the sanitation of water supplies and other branches of municipal sanitation; in preventive hygiene, such as mental, social, personal, and dental hygiene; and in public health education and public health administration—that medical school is sending out its graduates unprepared for some of the most serious problems they will have to face in the immediate future. The census of 1920 shows that our people lately rural, are rapidly becoming urban, and urbanization spells sanitation.

Obviously, all these subjects can not be injected into a curriculum already overcrowded. The only way out is to recognize the situation, and to meet it squarely by erecting a separate superstructure for public health training upon the same foundation which already underlies medical training, replacing surgery, obstetrics, gynecology, materia medica, therapeutics, pharmacology, and other purely medical subjects by subjects in public health, such as those just mentioned. The medical man without further training has been tried as a modern health officer, and, broadly speaking, found wanting; and it is for this reason that special schools of hygiene and public health are springing up here and there. These, however, are, and long will be, wholly inadequate to supply the needs of the time, and our only hope at present for any adequate relief is that the medical schools of the land shall seize the opportunity that is theirs, to divert into the public health channels, with proper preparation, some of the talent now going into medicine. If what we hear of the coming "socialization" of medicine—by which we mean that tendency now everywhere discoverable to substitute physicians employed and paid by the State for physicians dependent on private practice—be true, such a diversion can not come too soon.

Since this paper was written it has come to my attention that the Harvard Medical School has this summer established the degree of Doctor of Medical Sciences (D. M. S.) for the benefit of those who, having satisfactorily completed the first two years of the medical school, desire to devote the last two years exclusively to one of the medical sciences. This is obviously a long step in the right direction, since a student desiring to enter the field of the public health may now do so, with special preparation and without waste of time. The degree of Doctor of Medical Sciences will not, however, be either sought for or valued as the degree of Doctor of Public Health would be, by those engaging in public health practice. For them it will be much as it would be for those about to practice medicine to hold the degree of D. M. S. instead of M. D.

It is said that the medical colleges of the United States in the eighteenth century (1762) were on a very high level; that they then began to lower their standards and that—as we have seen—in the nineteenth century the requirements for the degree sank very low. However, all this may have been, there is no doubt that to-day, in the twentieth century, medical colleges like this one whose centennial we are celebrating stand among the highest and the best of the educational institutions, not of our country only but of the world. The degree of Doctor of Medicine has been rescued from its low estate and is now the peer of any doctorate.

I bring to you, Mr. President, and to you, gentlemen of the board of directors, to you, members of the faculty, to the student body, and especially to the citizens of Cincinnati, of which this college is an ornament and a distinction, the congratulations and felicitations of other educational institutions of our land. If in the future you shall make it possible to add to the excellent medical education which you now give, education in the public health, i. e., in the health of the people, in preventive medicine, in preventive sanitation, and in preventive hygiene, opportunity for which is nowhere so great as in a municipal university, because of the close association which such a university enjoys with departments of public health and public water, public sewers, and public schools, public buildings, public streets, public baths, and public gymnasia—all of which stand available for educational cooperation and research—you will not only deserve and win the applause of a grateful community, but you will blaze the way for a reform imperatively needed in other medical colleges. Modern medicine must provide a training for the practice of the public health no less rigorous than that for the practice of medicine; for the public health is the health of the people, and, as the Latin phrase puts it, *Salus populi suprema lex.*

A PRELIMINARY STUDY OF THE PHYSIOLOGICAL EFFECTS OF HIGH TEMPERATURES AND HIGH HUMIDITIES IN METAL MINES.

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Introduction.

One of the most important problems encountered in present-day metal-mining practice is that of providing efficient ventilation, especially in those mines which have high air temperatures and high relative humidities in extensive workings at considerable depths, or in workings where mine fires are found or where there is much oxidation of timber or of ore. It has long been recognized that mine workers subjected to hot, humid, stagnant air and to certain harmful dusts in many of our metal mines contract miners' consumption and possibly other diseases; and although considerable study has been made of the effects of dusts, temperatures, and humidities in mines of England,[1] South Africa, and of some European countries,[2] very little of this kind of study has been done in the United States, especially as regards the effect of high temperatures and high relative humidity in our mines.

The following study was made in two comparatively deep copper mines, both with fairly high temperatures and humidities, one in which practically no attempt at ventilation was made and one with a ventilation system of a much more efficient nature than is generally found in metal mines. In both mines the data were taken at points over 2,000 feet below the surface and with surrounding rock temperatures generally in excess of 90° F.

In general, the following data were taken: Surface air temperatures and relative humidities and body temperature, blood-pressure readings, pulse, time of day. Data taken underground at each place visited included temperature and humidity readings of air in working places, occasionally rock and water temperatures, temperature of compressed-air blowers, air movement or velocity, kind of work being performed, exact time of day, number of workers, and bodily tem-

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[1] Haldane Journal of Hygiene, Vol. V, pp. 494, 1905.

[2] Oliver: Diseases of Occupation.